

REPORT NO. E90-216

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		DRN		SFENA - CORPORATION		
TOLERANCES:		CHK	<i>DW</i>	3/14/90	GRAND PRAIRIE - TEXAS	
FRACTIONS DECIMALS ANGLES		APP	<i>B. Dillman</i>	3/20/90	STATIC TEST OF THE SX-16 NIGHTSUN INSTALLED ON BHTI MODEL 412 HELICOPTER	
$\pm \frac{1}{32}$ $\pm .002$ $\pm .003$ $\pm 1^\circ$		CONTRACT :				
SFENA APP		SIZE	CODE IDENT NO.		DWG NO.	
		A	58356		E90-216	
CUST. APP		SCALE	N/A	WT.	-	SHEET 1 of 10

STC SH7744SW

REPORT NO. E90-216

STATIC TEST OF THE SX-16 NIGHTSUN  
INSTALLED ON THE BHTI 412 HELICOPTER  
(Ref. Project No. SW-170-489)

PART I: TEST PLAN

B. Dickson  
B. Dickson

STATIC TEST OF THE SX-16 NIGHTSUN  
INSTALLED ON THE BHTI MODEL 412  
HELICOPTER

SIZE	CODE IDENT NO.	DWG NO.
A	58356	E90-216
SCALE	REV.	SHEET
N/A	B	2 Of 10

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RECORDED BY: RAYMOND J. GALLAGHER  
INVESTIGATOR: RAYMOND J. GALLAGHER  
SUBJECT: ROBERT M. KIRKWOOD

## INTRODUCTION

This report is written to document a static test of the SX-16 Nightsun, installed on a BHTI model 412, in accordance with SFENA Drawing No. B30-13003. The test is to fulfill part of the requirements toward the issuance of an STC by the FAA. The test will show compliance with FAR 29.561. Additionally, the drag force which occurs on the externally mounted SX-16 will also be considered.

The procedure used to calculate the drag will be the same as previously used in Report No. E89-207 pursuant to an STC (reference Project No. SW-170-482).

The test will be conducted at the SFENA facility at Grand Prairie Municipal Airport. The test will be conducted by the writer. Should the FAA Structures Engineer wish to witness the test, please notify the writer or Dave Neese at SFENA Corporation when approval of the test plan is completed.

The results of the static test of the SX-16 Nightsun will be reported as Part II of this report.

STATIC TEST OF THE SX-16 NIGHTSUN INSTALLED ON THE BHTI MODEL 412 HELICOPTER	SIZE <b>A</b>	CODE IDENT NO. <b>58356</b>	DWG NO. <b>E90-216</b>
	SCALE <b>N/A</b>	REV. <b>B</b>	SHEET <b>3 of 10</b>

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## TEST LOADS

The test loads to be applied to the SX-16 Nightsun installation are described below. For this test, in order to preclude possible damage to the SX-16, it will be removed from the gimbal. All test loads will be applied through the C.G. of the Nightsun. The weight of the Nightsun and gimbal is 37 lbs. The weight of the mounting provisions is less than 3 lbs, but conservatively, 3 lbs will be used for the test. This weight will also be assumed at the C.G. of the Nightsun.

### Drag Load:

$$D = \frac{1}{2} (d \times V^2 \times CD \times A), \text{ where}$$

D is drag in pounds.

d is density of air, 0.00237 slugs/ft<sup>3</sup>.

V is velocity, 154 Kt or 260 ft/second.

CD is coefficient of drag, 1.12.

A is area projection of Nightsun, 1.833 ft<sup>2</sup>.

The calculation of drag {D} yields a value of 164.5 lbs.

The ultimate load for drag is  $1.5 \times 164.5 = 247$  lbs., use 250 lbs. for test.

Because the 4g forward crash value is lower than the drag load, and since the mounting provisions for the Nightsun are basically symmetrical in the fore and aft direction, the drag load will be applied, based upon its value exceeding the inertia load calculated below.

The forward, lateral and downward loads are calculated as follows:

### Forward:

$$4G \times 40 \text{ lbs} = 160 \text{ lbs, applied forward.}$$

### Lateral:

$$2G \times 40 \text{ lbs} = 80 \text{ lbs, applied to the left or right.}$$

### Downward:

$$4G \times 40 \text{ lbs} = 160 \text{ lbs, applied downward.}$$

The installation must withstand the above described loads without any structural failure or permanent deformation.

STATIC TEST OF THE SX-16 NIGHTSUN  
INSTALLED ON THE BHTI MODEL 412  
HELICOPTER

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STATIC TEST OF THE SX-16 NIGHTSUN  
INSTALLED ON THE MODEL BHTI 412 HELICOPTER  
(Ref. Project No. SW-170-489)

PART II: RESULTS

*B. Dickson*

B. Dickson

STATIC TEST OF THE SX-16 NIGHTSUN  
INSTALLED ON THE BHTI MODEL 412  
HELICOPTER

SIZE	CODE IDENT NO.	DWG NO.
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SCALE	N/A	REV. B

## TEST RESULTS

The test of the SX-16 Nightsun on a Model 412 helicopter in accordance with the SFENA Drawing No. B30-13003 was conducted exactly as proposed in Part I of this report.

In accordance with the test plan, a forward, downward and lateral load was applied assuming the center of gravity of the installation to be located at the gimbal pivot axis on centerline of the light assembly.

Figures 1 through 3 show the SX-16 installation while undergoing testing. There was no excessive deflection or failure of any of the hardware associated with the installation.

STATIC TEST OF THE SX-16 NIGHTSUN  
INSTALLED ON THE BHTI MODEL 412  
HELICOPTER

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## CONCLUSION

It is concluded that the SX-16 Nightsun installation tested on a Model 412 helicopter is structurally acceptable based on the successful completion of testing as described in this report. Therefore, the installation meets all structural requirements of FAR Part 29 towards the issuance of an STC.

STATIC TEST OF THE SX-16 NIGHTSUN  
INSTALLED ON THE BHTI MODEL 412  
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FIGURE 1 -- SX-16 NIGHTSUN INSTALLATION DURING THE APPLICATION OF THE 250 LB DRAG LOAD.

STATIC TEST OF THE SX-16 NIGHTSUN  
INSTALLED ON THE BHTI MODEL 412  
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FIGURE 2 -- SX-16 NIGHTSUN INSTALLATION DURING THE APPLICATION OF THE 80 LB LATERAL LOAD

STATIC TEST OF THE SX-16 NIGHTSUN  
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FIGURE 3 -- SX-16 NIGHTSUN INSTALLATION DURING THE APPLICATION  
OF THE 160 LB DOWNWARD LOAD

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STATEMENT OF COMPLIANCE WITH THE FEDERAL AVIATION REGULATIONS				DATE MARCH 20, 1990
AIRCRAFT OR AIRCRAFT COMPONENT IDENTIFICATION				
MAKE BELL	MODEL NO. 412	TYPE (Airplane, Radio, Helicopter, etc.) HELICOPTER	NAME OF APPLICANT SFENA CORP.	
LIST OF DATA				
IDENTIFICATION	TITLE			
REPORT EE90-216 Rev. B dated 3/20/90	"STATIC TEST OF THE SX-16 NIGHTSUN INSTALLED ON THE BHTI 412 HELICOPTER" Part II: Results			
REF: PROJ NO. SW-170-489				
PURPOSE OF DATA Structural consideration of the installation of SX-16 Nightsun installed dn model 412				
APPLICABLE REQUIREMENTS (List specific sections) FAR 29: Para 29.561(a), 29.561(b), 29.561(c)				
<p><b>CERTIFICATION</b> - Under authority vested by direction of the Administrator and in accordance with conditions and limitations of appointment under Part 183 of the Federal Aviation Regulations, data listed above and on attached sheets numbered _____ have been examined in accordance with established procedures and found to comply with applicable requirements of the Federal Aviation Regulations.</p> <p>I (We) Therefore <input type="checkbox"/> Recommend approval of these data <input checked="" type="checkbox"/> Approve these data</p>				
SIGNATURE(S) OF DESIGNATED ENGINEERING REPRESENTATIVE(S)  <i>B. Dickson</i>	DESIGNATION NUMBERS(S) SW-474	CLASSIFICATION(S) Structural		

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